

Profitability, Liquidity and Solvency of Wood Harvesting Contractors in Finland

Markku Penttinen · Arto Rummukainen ·
Jarmo Mikkola

Accepted: 27 September 2010 / Published online: 15 October 2010
© Steve Harrison, John Herbohn 2010

Abstract In order to respond to global competition challenges, the wood-processing industry in Finland and elsewhere is outsourcing roundwood harvesting to harvesting contractors. The industry also seeks to negotiate with fewer, larger and more diverse contractor enterprises. The weak profitability, liquidity and solvency of harvesting contractors and the consequent difficulty in hiring qualified machine operators make networking and enterprise growth a complicated process. Financial data of 1,060 Finnish wood harvesting contractors from the period 2001 to 2007 were studied using the ‘closing of the accounts’ data. The material represents most of the full-time contractors. For 2007 net profit was about 6%, credit share of turnover over 50% and median financial reserve €18,000. High machine depreciation and interest expenses together with low solidity make it difficult for small enterprises to absorb seasonal variations and to cope with recessions. Profitability varies considerably amongst smallest enterprises, which most often are sole-operator enterprises. Moreover, even the median profit of the smallest enterprises tends to be negative, which means that enterprise capital will be consumed and many enterprises are at risk of failure. Larger enterprises are more likely to be limited liability companies. Their median profit is clearly positive and the profit varies relative little between enterprises.

Keywords Forest machine · Ratio analysis · Financial reserves · Business survival

M. Penttinen (✉) · A. Rummukainen · J. Mikkola
Finnish Forest Research Institute, Box 18, 01301 Vantaa, Finland
e-mail: markku.penttinen@metla.fi

Introduction

Forest harvesting contractors have been responsible for industrial roundwood harvesting in Finland for over 40 years (cf. Högnäs 2000; Uusitalo and Markkola 2006). Nowadays, energy wood harvesting is also an increasingly significant task, with growing volume. Some contractor entrepreneurs also take on the production of heat for local communities using bio-fuelled power plants (Solmio and Alanen 2008). Forest regeneration tasks (soil preparation, seeding and increasingly planting) are also carried out by wood harvesting contractors. Depending of the criteria, there are 1,600–2,500 forest machine contractors in Finland (Penttinen et al. 2009).

In Finland, three international forest industry companies buy two-thirds of the roundwood harvesting services and more than half of the energy-wood harvesting services (Finnish Statistical Yearbook of Forestry 2009). Work is generally carried out under agreements of a few years' duration based on bilateral negotiations or by bidding. In most cases, the industrial customer decides upon the working order of stands.

In 2007, wood harvesting contractors cut and forwarded 57 Mm³ of roundwood, which represents about 90% of the total roundwood removals (Finnish Statistical Yearbook of Forestry 2009). The value of this work was about 513 M € (Table 1). Contractors also carried out energy-wood harvesting, soil preparation and other tasks valued at about 58 M €. Year 2007 was the record commercial roundwood removal year in Finnish history.

The first generation of contractors is retiring, while customers prefer to give larger contracts to contractors. These expanding pressures and the financial recession are forcing the contracting business to change.

In recent years, the large industrial customers in Finland have outsourced the operational supervision of roundwood acquisition to forest machine contractors and have encouraged the growth of contractor enterprises. It is up to the contractors whether they network with smaller contractors; grow by buying new machines or by buying other contracting enterprises. Similar developments have already occurred in other industries. The first generation of wood harvesting entrepreneurs has reached retiring age, which makes structural change possible. Business expansion requires knowledge of management, as well as leadership skills, both of which often seem to increase profitability (Soirinsuo and Makinen 2009). Expansion tends to increase the

Table 1 Work volumes and compensation of wood harvesting contractors in Finland, 2007

Type of work	Volume or area	Compensation ^a (M €)
Traditional roundwood harvesting solid volume	54.7 M m ³	513.0
Residual energy wood harvesting solid volume	2.5 M m ³	23.9
Silviculture work	190,672 ha	34.2
Total value of wood harvesting contractors' work in 2007		571.1
Total value of wood harvesting contractors' work in 2006		493.2

Source: Finnish Statistical Yearbook of Forestry (2009)

^a Compensation is calculated by multiplying work volumes by average costs paid by customers

types of services offered to customers, some of which can be based on a harvester and forwarder, but stump harvesting and chipping, for example, require new types of machines. In any case, financial reserves are needed for expansion.

Restructuring is difficult because of the persistently low profitability of the harvesting business. This also hampers the ability to hire highly qualified managers and operators. Capital costs make up a substantial proportion of the total cost because of the high cost of specialised machinery. Thus, seasonal and economic variations can have severe impacts on the business. However, the asymmetry of negotiating power between large companies and small harvesting contractors persists (Alajoutsijärvi et al. 2001).

The Trade Association of Finnish Forestry and Earth Moving Contractors (2009) represent the main actors in the wood harvesting business. The association has monitored its members' financial situation for about 30 years. Nowadays it asks members about their balance sheets and their views on the future of their business (The Trade Association of Finnish Forestry and Earth Moving Contractors 2008). The banking group Pohjola annually monitors its wood harvesting contractor customer's financial situation (Turkulainen 2008). Mäkinen (1988) investigated factors of business success and failure in an extensive study of wood harvesting contractors. The general trend over the past 20 years has been that a fifth to a quarter of contractors makes losses. Firms in the highest performing quartile are profitable, but they can be adversely affected by the general economic situation and fluctuations. Most enterprises have a high debt to cash flow ratio.

Väkevä and Imponen (2001) investigated nearly 800 contractors who work for the members of the Finnish Forest Industries or the State Forest Service. Beside the generally low profit and heavy debt burden, the study revealed minor regional variations in profits; contracting enterprises in Lapland had slightly lower profits than those in southern Finland. Enterprises with a turnover of less than 83,000€ per year were excluded. Above this level, the profit of the smallest companies had the greatest variation, the majority of loss-making businesses also appearing in this group. Variations in net profit decreased slightly with growing turnover. A study of enterprises with only one harvester-forwarder chain showed that the larger the yearly volume cut the higher the profit. A high proportion of thinning in the total work volume decreased profitability slightly.

This paper examines current financial performance of the forest harvesting business in Finland and identifies its problems and strengths. The financial viability of forest harvesting contractors is also examined, together with the ability of firms to cope with the restructuring of the forest harvest contracting business. A key question is whether forest harvesting enterprises have growth opportunities.

Research Method

Data concerning timber harvesting contractors used in this study were retrieved from the forest machine register of the Finnish Vehicle Administration, obtained from AKE (2008). According to its register there are about 4,700 harvesters and

forwarders capable of effective forest work and approximately 2,500 forest harvesting contractors in Finland.¹

Statistics Finland (2009) provided the annual financial statement data consisting of profit and loss statements and balance sheets for the years 2001–2007 based on the FVA enterprise list. Financial data of Statistics Finland apply to about 1,600 contractors with turnover data, the number varying between years. However, only about two-thirds of the contractors have provided their financial statement data, so that more detailed figures are based on data for 1,060 contractors. These contractors represent contractors with a slightly larger turnover than the average.

All available financial data from the period 2001 to 2007 were used for effectiveness studies by applying financial ratio analyses (as described by Salmi and Martikainen 1994), and focusing on the profitability, liquidity and solvency of subgroups, as well as the whole wood harvesting business.

Profitability has been shown to be the best indicator of business performance (Brozik 1984). Modern financial theory is based on the rational wealth maximization paradigm, described by Fatemi and Luft (2002). This profitability interpretation, say through net present value (NPV), has traditionally been a basic assumption, especially in US sources (e.g. see Beranek 1975).² In the present study, the empirical evidence favours measurements of annual profitability and its development, although the available database also contains net wealth of entities. The main focus here is the operational effectiveness and profitability of the wood harvesting business. Profitability is analysed by studying the *structure of profit* and the *return on capital*.³

Here, the *structure of profit* from the annual profit and loss statements gives an adjusted income statement based on expense categories: *operating margin (EBITDA)*,⁴ *operating profit (EBIT)*, *net profit*, total profit, and profit⁵ from the fiscal year (CCA 2000).⁶ The *financing profit*, which is obtained by adding depreciation and reductions back into the net profit, forms a cornerstone of the financing analysis (CCA 2005).

Return can be calculated on total assets, invested capital and the enterprise's own capital (called equity). The return on assets (ROA) is obtained by dividing the sum of net profit, financial expenses and taxes by average adjusted balance sheet total,

¹ The Nordic cut-to-length system is predominant in Finnish wood harvesting. Trees are cut and processed to wood assortments by harvesters (weight 14–19 tons) and then transported to roadside by forwarders (tare weight 12–18 tons).

² Distinctions between wealth maximization and the more widely examined construct of profit maximization are explained in Poitras (1994).

³ The definition, structure and use of financial ratios is based on the definitions of CCA (2005) and Yli-Olli and Virtanen (1985).

⁴ The abbreviations EBITDA and EBIT refer to 'earnings before interest, taxes, depreciation and amortisation' and 'earnings before interest and taxes'.

⁵ Some sources use words 'income' or 'result' instead of profit such as 'net income' or 'net result'.

⁶ The EU 4th company law directive establishes the minimum requirements for published financial information (annual accounts) by limited liability companies. It requires that the costs must not be divided into variable and fixed costs. This prohibition has been incorporated in the Finnish accounting decree (Teränte 1993). The gross margin on sales, computed as turnover minus variable costs, is therefore not available.

i.e. total assets. The return on investment (ROI) has the same numerator but with total invested capital, the sum of equity and external capital, as the denominator. The return on equity (ROE) can be obtained by dividing net profit by equity (CCA 2005).

The Finnish accounting tradition relies on the expenditure-revenue theory (Salmi 1978, Kettunen 1993 and Pirinen 2005), and emphasises the profit and loss statement and net profit as its key measures (Penttinen 2007). Conversely, both the American and the present European International Financial Reporting Standards (IFRS) for accounting concentrate on property values. The IFRS of the European Union favours the ROA or ROE (Laitinen and Laitinen 2004).

The most important indicator of the operational activities of a small or medium sized enterprise (SME), including all harvesting contractors, is the ROI (Mäkinen 1988, 1993; Väkevä and Imponen 2001). Recall that the special feature of the timber harvesting business is the use of expensive harvesters and/or forwarders. A new middle size harvester for final felling costs about 400,000 €. In SMEs, the equity may be difficult to quantify, if not actually misleading, so that the ROE may be inaccurate.

The return on capital employed (ROCE),⁷ ROA, ROE and ROI are based both on the contribution delivered by sales and the sales in relation to the total investment, the relation between which is called the Du Pont return on investment formula. The ROI is defined as earnings (the sum of net profit, financial expenses and taxes) as a percentage of sales multiplied by turnover ratio, where the turnover ratio is the value of sales divided by total invested capital (e.g. see Johnson and Kaplan 1987).

Although profitability is the starting point of all considerations, it is linked to other important items, such as financial adequacy and capital structure.⁸ High profitability is of no benefit if there are financing difficulties. A financing crisis can be fatal to a contractor, especially during rapid growth, despite excellent profitability and business opportunities. On the other hand, successful financing improves the profitability, liquidity and solvency of an enterprise.

In SMEs, *financial adequacy* demonstrating the firm's *liquidity* is essential and often critical, especially during periods of recession. The *liquidity* ratios could be grouped into *dynamic liquidity*, such as the financing profit percentage, and *static liquidity*, such as a commonly used indicator called quick ratio, which relates financial assets to short-term liabilities.⁹ Recall that the financing profit is obtained by adding both depreciation and reductions in value of fixed and other non-current assets, back to the net profit (CCA 2005). This *financing profit* can be considered a basis for studying the financing of an enterprise. It clearly depicts survival opportunities of an enterprise and it has to be positive even over a short timeframe, otherwise bankruptcy threatens. The level of this ratio is perhaps the most critical information when analysing the ability of an enterprise to cope with (i) the net

⁷ For example Stora Enso's target is to achieve 13% ROCE (Stora Enso 2007). In SMEs, one can hardly distinguish ROI and ROCE.

⁸ SMEs have been studied in Finland using the growth-profitability-financing approach, the so-called KASKARA model. This model has also been applied to wood harvesting contractors by Kärhä (2000).

⁹ The use of ratios is based on the definitions of CCA (2000, 2005) and Yli-Olli and Virtanen (1985).

Table 2 Number of forest machine contractors, turnover and number of machines by turnover class, Finland, 2007

Turnover class (1,000 €)	Contractors		Total turnover of enterprises in class		Machines	
	Number	Relative frequency (%)	Value (M €)	Relative frequency (%)	Number	Relative frequency (%)
Below 75	282	17.1	13.5	1.8	339	8.5
75–150	324	19.6	36.0	4.9	418	10.5
150–300	356	21.5	75.8	10.2	609	15.3
300–600	341	20.6	142.5	19.2	864	21.7
Over 600	350	21.2	473.3	63.9	1,751	44.0
Total	1,653	100	741.1	100	3,981	100

decrease in long-term external financing, (ii) net investment, (iii) addition of working capital, and (iv) the profit-sharing requirement. The excess part of financing profit after deducting (i)–(iv) is the *reserve*, in which instalments of debts and financing of investment have been deducted from the financing profit. The reserve can be considered a basic equation of financing.

Solvency depicts the capital structure and consists of indicators of *dynamic solvency*, such as liability payback period, and *static solvency*, such as the equity ratio (Laitinen and Laitinen 2004). *Capital structure* depicting the firm's static solvency provides only a general picture. Here, the dynamics of economic processes—flows—are emphasised and static factors—reserves—are primarily only background information.

Enterprise Size and Financial Situation

The roundwood harvesting business is dominated by small enterprises with more than 60% of contractors owning only one machine. The largest enterprises possess about 30 machines and employ about 60 operators. Small enterprises dominate in number but big enterprises produce most of the turnover (Table 2).

Compensation for work (Table 1) is smaller than total turnover of enterprises (Table 2) because some enterprises have other businesses besides harvesting.

The Net Profits Burden of Small Enterprises

The *structure of profit* of a wood harvesting enterprise reveals whether it has possibilities to grow and if it can survive recession. Larger enterprises are needed in the future, but the question is, how it is possible for a business to grow?¹⁰ In the

¹⁰ It has been argued that real-world entrepreneurs may not be profit maximisers; being constrained by limited business acumen they may be content to achieve a satisfactory economic result—the so-called *satisficing principle* (e.g. Earl 1983).

Table 3 Key median profitability indicators of Finnish wood-harvesting contractors, by turnover class, 2007

Key figure	Turnover class (1,000€)					Description of the ratio
	≤75	75–150	150–300	300–600	≥600	
Median turnover (1,000€)	51.7	111.2	212.3	404.8	948.5	Business volume
Median operating margin (%)	27.8	34.3	30.9	29.4	25.2	Operational result
Median operating profit (%)	7.9	14.6	12.6	10.5	9.6	Operational result after depreciation
Net profit (%)	−1.4	6.2	6.6	5.6	5.7	Result of the business
Median net profit (1,000 €)	−0.1	7.5	16.5	24.7	62.5	
Median financing profit (%)	18.4	27.0	25.1	24.4	21.1	Financing contribution of the business
Median financing profit ^a (1,000) €	10.0	29.9	55.6	102.3	233.3	
Median net profit % in 2000			7.2			

^a The financing profit is needed for loan amortisation, investments, increase of working capital and profit distribution (CCA 2005)

wood-harvesting business, the total operating income tends to equal the turnover, which is the starting point of following calculations.

Turnover, also called net turnover or net sales, is sales revenue after deductions such as value-added taxes and sales discounts. *Operating margin*, also called operating profit before depreciation and amortisation, represents turnover minus operating expenses. The *operating profit* is obtained after deducting depreciation and reductions in value of fixed and other non-current assets from operating margin. *Net profit* emerges after incorporating interest and financing incomes and expenses, reductions in value of investments and direct taxes. *Financing profit* emerges from adding depreciation and reductions in value of fixed and other non-current assets back to net profit (CCA 2005).

In order to eliminate the effect of the enterprise size on the analysis, the operating margin, operating profit, net profit and financial profit are divided by turnover, the respective percentages being displayed for 2007 in Table 3. These turnover-related profitability structure ratios depict a general view rather than revealing bottlenecks in the business. A key ratio with respect to profitability is the net profit percentage which depicts the development of profitability (CCA 2005; Kallunki and Kytönen 2007). The profitability structure starting with operating margin and ending with financing profit is disclosed by turnover class in Table 3. The most central observation of each variable in question, the median, is reported rather than the mean value. For comparison, net profit value in 2000 is given by Väkevä and Imponen (2001).

The inquiry of the Finnish Forestry and Earth Moving Contractors (The Trade Association of Forest and Earth Moving Contractors 2008) gave the median net profit level as 2.5% for 2006 and 4.3% for 2007, claiming that a positive net profit could be obtained by 65% of the enterprises. Moreover, enterprises in which thinning amounted to less than 50% of total work load achieved a 5.0% median net profit and enterprises with more than 50% thinning only a 3.3% median net profit, in 2007. More than 50% of the entrepreneurs considered that their profit was

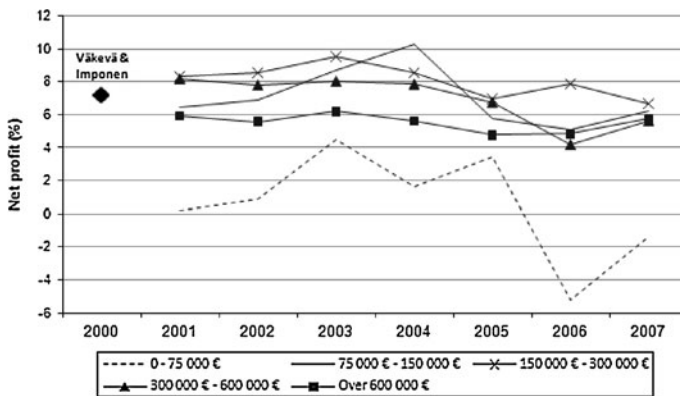


Fig. 1 Median net profit percentage of Finnish wood harvesting contractors by turnover class, 2001–2007

satisfactory and more than 20% considered it less than satisfactory. However, according to 55% of the contractors, the price level has remained steady, while the remaining 45% said it has increased. The most important item to be improved, according to the replies, was the compensation level of the services according to 49% of the enterprises.

The net profit share started to decrease in 2003–2004. The trend of net profit percentage by turnover class reveals differences between enterprise size groups, and especially the weakness of the smallest enterprises (Fig. 1). Differences of net profit between larger enterprise classes are smaller, but the largest two classes seem to have had smaller net profit than medium size enterprises. In all, the profitability has tended to decrease. The median net profit rate was 7.5% in 2000 (Väkevä and Imponen 2001).

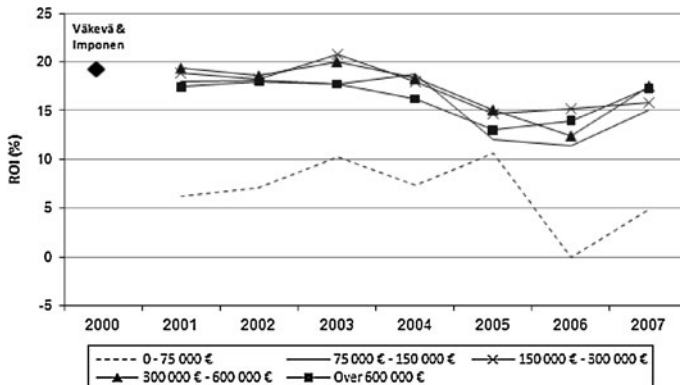
According to the sample studies of Mäkinen (1988, 1993), median net profits were negative during the 1980s and 1990s. Negative net profit is considered weak according to Pohjola Bank. In 2000, the median net profit rate was about 7.2% in 2000 (Väkevä and Imponen 2001), but declined slightly to about 6% in 2007.

The degree of mechanisation in Sweden is about the same as in Finland. The profitability of wood harvesting businesses there is also low (Pekka 2008). The degree of mechanisation and the customer structure varies in other European countries, but profitability problems prevail everywhere (Rummukainen et al. 2006). The level of net profit of the wood harvesting business was low compared to many other industries in Finland, except for wood products industries, which achieved a 2% net profit rate (Ministry of Employment and the Economy 2009).

The size of balance sheet, invested assets, equity as well as ROA, ROI and ROE reveal key features of the wood harvesting business (Table 4). Recall that the *return on total assets* (ROA) stands for net profit, financing expenses and taxes divided by the annual average of the total assets in the balance sheet during the fiscal year. The numerator of the *return on investment* (ROI) is as above, but the denominator is the sum of own so-called equity capital and creditor capital. The numerator of the *return on equity* (ROE) is only net profit and the denominator own capital on

Table 4 Medians return on total asset (ROA), on investment (ROI) and on equity (ROE) of Finnish wood-harvesting contractors by turnover class, 2007

Investments and returns	Turnover class (1,000€)					Description of the ratio
	≤75	75–150	150–300	300–600	≥600	
The sum of balance sheet (1,000€)	65.4	110.0	199.7	358.3	789.5	Total assets of the firm
Return on assets (ROA) (%)	4.1	13.4	14.0	12.7	12.9	Return on total assets
Invested capital (1,000 €)	64.6	99.6	169.3	281.0	588.1	Own and debt capital of the firm
Return on investment (ROI) (%)	4.9	15.0	15.8	17.5	17.3	Return on invested capital
Equity (1,000 €)	12.0	15.4	37.8	52.4	211.9	Own capital of the firm
Return on equity (ROE) (%)	9.5	10.6	14.1	22.1	19.9	Return on own capital
ROI in 2000			18.9			

**Fig. 2** Median return on investment (ROI) of Finnish timber harvesting contractors by turnover class, 2001–2007

average during the fiscal year (CCA 2005). For comparison, ROI in 2000 is given by Väkevä and Imponen (2001).

The ROA is considered high if it is over 10%, satisfactory at 5–10% and poor below 5% (CCA 2005). The statistics on the wood-harvesting business provided by the Pohjola Bank classify the ROI as good if it exceeds 15%, satisfactory at 9–15% and poor below 9% (Väkevä and Imponen 2001). Surprisingly, the ROI achieved at least the 15% level, except for the smallest enterprises. The median ROI was as high as 18.9% in 2000 (Väkevä and Imponen 2001), but in 2007 was slightly lower at 15.8%.

Both the ROI and the ROA have clearly been decreasing over time. This can be explained by both the increase in amount of bound capital and the decrease in net profit itself. The difference in ROI by turnover class is shown in Fig. 2, and reveals the difficult situation of the smallest enterprises.

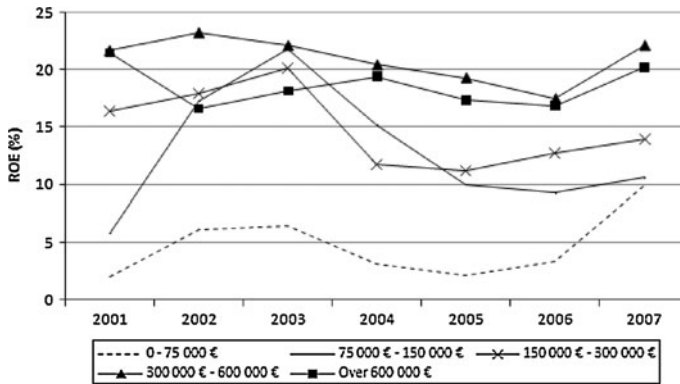


Fig. 3 Median return on equity (ROE) by turnover class, Finnish timber harvesting contractors, 2001–2007

ROE is used when the equity capital only is seen as the investment. Its median was nearly 20%, but about one quarter of the enterprises could not achieve a positive ROE. The negative ROE suggests that capital will be consumed and many enterprises will have to close down. The ROE by turnover class also emphasises the distinction between the smallest enterprises and the others (Fig. 3).

In general, ROE can be misleading because a small amount of equity capital compared with the large amount of debts causes the so-called leverage phenomena,¹¹ which exaggerates ROE in both good and bad times (Luoma and Spiller 2002). Moreover, equity, also called own capital, is a vague concept in many SMEs. However, ROE is a clear indicator of the development potential of the enterprise.

All turnover ratios represent the DuPont approach, such as the asset turnover (e.g. ROA) and turnover divided by total assets (Johnson and Kaplan 1987), the last of which were surprisingly stable.¹²

Financial Adequacy and the Reserves are Low

Perhaps the most realistic, meaningful and basic information depicting *financial adequacy* and more precisely dynamic solvency is the *repayment period* of debts in years—the *payback period*. Payback period makes allowance for capital loans taken by owner, but the debt/operating margin recognises even capital loans, which explains the difference. This is the invested external capital divided by financing

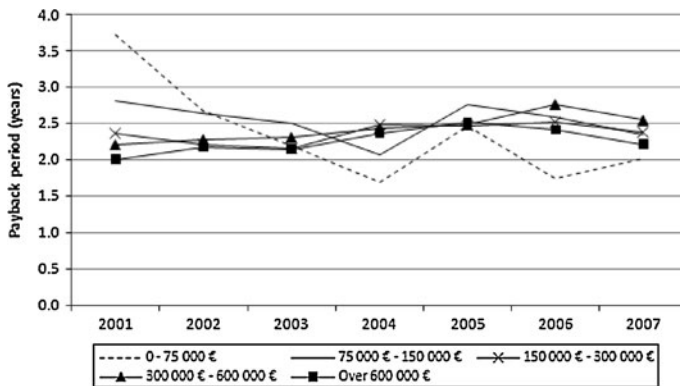
¹¹ If an enterprise borrows money, say at 5% interest rate and the business yields, say, 8%, a 3% profit can be earned. In contrast, supposing that the business yields only 2%, as during a recession, a 3% loss eats into the equity capital of the enterprise. Where the own capital share is modest, the leverage phenomena can benefit or seriously reduce the ROE (e.g. see Tornator 2003).

¹² The median of turnover divided by total assets over all enterprises has been surprisingly stable, remaining at the 1.1 level. The trend by turnover class has also been stable and has not revealed any success or failure factors. The small enterprise group performed least well, slightly below 1.0, and the largest enterprise group performed best, at approximately 1.4, but all groups were highly stable in all years.

Table 5 Medians of financial adequacy of Finnish wood-harvesting contractors, 2007

Key ratio of financial adequacy	Turnover class (1,000€)					Definition of the ratio
	≤75	75–150	150–300	300–600	≥600	
Payback period (years)	2.1 ^a	2.4	2.5	2.6	2.3	Debt/financing result
Debt/operating margin (years)	2.7 ^a	2.1	2.1	2.2	2.0	Debt/operating margin
Financial expenses coverage ratio	6.0	7.7	10.3	11.5	14.1	Operating profit and financial returns/financial expenses
Net financial expenses (%)	12.1	11.1	8.2	8.1	7.0	Net financial expenses/operating margin
Quick ratio	0.4	0.5	0.6	0.5	0.7	Financial assets/short-term debts

^a Payback period contains no capital loans taken by owner, but debt/operating margin recognises even capital loans, which explains the difference

**Fig. 4** Medians of the payback period by turnover class, in years 2001–2007

profit for the fiscal year (CCA 2005). Note that a special feature of timber harvesting businesses is that the capital is bound up in machines and equipment and, typically, the borrowed funds used to purchase them. When considering all Finnish wood-harvesting enterprises as a single group, the median payback period was only 2.5 years (Table 5, Fig. 4). The machines will typically be used for two to five years by the first owner. However, there are enterprises that may face some risk in payback commitments.

The *debts* can also be related to the *operating margin* (CCA 2005). This ratio helps to evaluate the operating profit level required to finance the business. This *external financing related to operating margin*, is obtained if it is imagined that the enterprise is using the whole of its operating margin for debt repayment. This ratio helps to evaluate the operating profit level required to finance the business. In practice, it provides a lower limit for the payback period assuming a situation in which all available resources are used to repay the debts (Table 5).

An alternative key to the analysis of financial expenses is the estimation of the *financial expenses coverage ratio*, which can be obtained by dividing the sum of

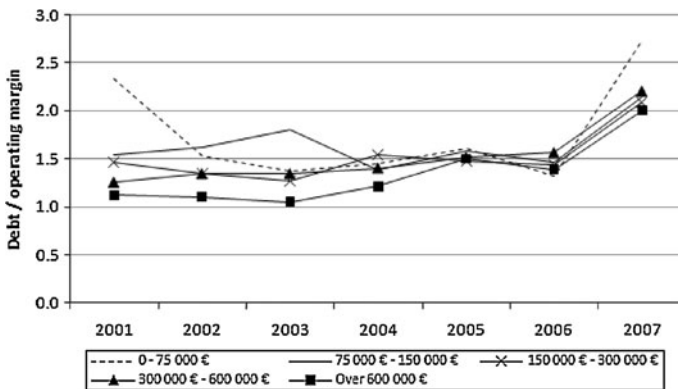


Fig. 5 Medians of the debt related to the operating margin by turnover class, in years 2001–2007

operating profit, dividend return, interest return and other financial returns by the financial expenses. This ratio measures the sufficiency of the operating profit and financial returns to cover the financial expenses and depicts the ability to manage financial expenses. *Net financial expenses divided by operating margin* helps to evaluate the opportunities to cover these expenses. The *quick ratio* relates financial assets to short-term debts¹³ (Table 5).

According to Salmi (2006), a payback period of 4 years or less is considered acceptable for all turnover classes. Similarly, the debt/operating margin is acceptable for all classes. However, only larger enterprises demonstrated sound median financial expenses coverage ratios, i.e. above 8. A quick ratio below 0.5 is considered poor and 0.5–1 satisfactory (CCA 2005). Even the median ratio of smaller enterprises has recently approached the weak quick ratio level, while larger ones have performed only slightly better.

The analysis continues by examining the ratios in the time period of 2001–2007. The medians of the *payback periods* by turnover classes vary surprisingly little (Fig. 4). Variation has been largest in the class of smallest enterprises.

The medians of the *debt related to operating margin* payback periods by turnover class reveal surprisingly modest differences between the smallest enterprises and the others. However, all medians (surprisingly) increased by about 0.5 years in 2007 (Fig. 5).

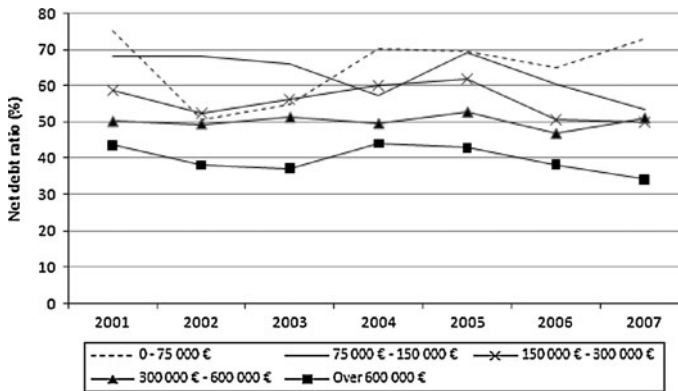
Ratios depicting the capital structure take into consideration borrowed funds and own financing, such as net liabilities and equity. The key indicator of *capital structure* can be considered to be the *net debt ratio*, which relates liabilities to turnover. When advances received and cash and marketable securities are subtracted from liabilities, this received net debt is related to turnover to give the *net debt ratio* (CCA 2005).¹⁴ At the aggregate level, its median was about 50% in 2007. The net

¹³ The quick ratio measures whether an enterprise can cope with the ‘quick’ short-term liabilities to be paid during the current fiscal year.

¹⁴ The *equity ratio* relates shareholder equity to the total assets of the balance sheet. It can be considered to measure the business’ own capital financing, the alternative to which is financing with debts, as measured by the debt ratios. This is, however, a very crude indicator, especially in the case of SMEs other than limited liability companies. The net debt ratio provides a more accurate picture than the equity ratio.

Table 6 Medians of capital structure of Finnish wood-harvesting contractors, 2007

Key capital structure ratio	Turnover class (1,000€)					Definition of the ratio
	≤75	75–150	150–300	300–600	≥600	
Net debt ratio (%)	73.1	53.5	50.0	51.1	34.1	Net debt/turnover
Equity ratio (%)	26.0	14.5	20.9	15.3	25.4	Equity/balance sheet total
Equity ratio in 2000			23.4			

**Fig. 6** Medians of the net debt ratio by enterprise turnover class, 2001–2007

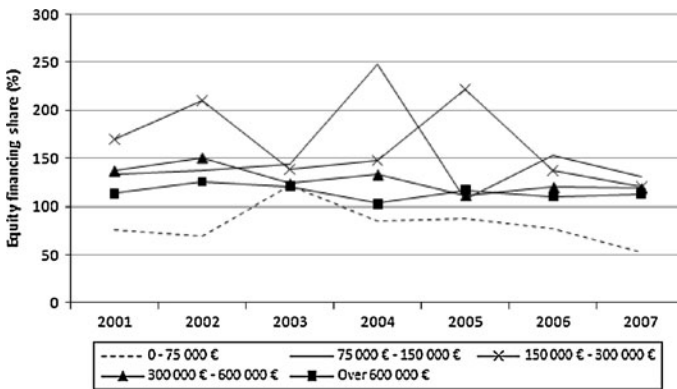
debt ratio was largest in smallest enterprises and best in largest enterprises (Table 6, Fig. 6). The *equity ratio*, which relates shareholder equity to the balance sheet total, was surprisingly stable about 20% in all years (Table 6). For comparison, equity ratio in 2000 is given by Väkevä and Imponen (2001).

The net debt ratio is considered favourable when it is below 40% and satisfactory when below 80% (CCA 2005), which means that the largest enterprises were performing well but the smallest ones poorly. The equity ratio is poor when it is below 20% and satisfactory when it exceeds 20% (CCA 2005), which suggests that enterprises of two turnover classes perform quite poorly. In 2000, the median of the debt ratio was satisfactory, at about 65%, and the median of the equity ratio was also satisfactory at nearly 24% (Väkevä and Imponen 2001), the latter being clearly better than in our study in 2007. The capital structure was favourable or at least satisfactory only in the case of the largest enterprises. *Net debt ratio* by turnover class reveals the poor position of the smallest enterprises and relatively best position of the largest ones (Fig. 6).

Investments can either succeed or fail financially, and therefore provide a basis for demonstrating the financing opportunities and threats. The median of gross investments was 40,000 € in 2007. However, the relation between *investment and turnover* remained at a median of 15.8%. In 2000, the median net investment was 35,000 € and the median of net investments related to turnover was 10%, but in 1999 this latter median level was 20% (Väkevä and Imponen 2001). Investments in

Table 7 Medians of investments and reserves of Finnish wood-harvesting contractors, 2007

Key investment ratio	Turnover class (1,000€)				
	≤75	75–150	150–300	300–600	≥600
Investments (1,000 €)	6.0	15.3	28.0	75.9	173.6
Investments/turnover (%)	12.9	12.4	13.7	17.8	17.5
Equity (own) financing share of investments (%)	52.3	130.5	119.7	119.0	112.9
Reserves (1,000 €)	−0.1	8.5	17.5	22.2	51.4
Reserves/financing profit (%)	−2.3	40.2	41.1	28.0	25.4

**Fig. 7** Medians of the equity financing share of investment by turnover class during the period, 2001–2007

euros were naturally larger in larger enterprises, but even the percentage value of investments was larger in larger enterprises (Table 7).

Equity financing, or *internal share of investments*, is defined as the financing profit divided by investments. It shows how far the financing profit covers investment in fixed assets and other investments, as well as the addition of working capital (CCA 2005). When investments are negligible, this ratio may increase without limit. At the aggregate level, the median exceeded 100%, although the smallest enterprises invested less than the others (Table 7 and Fig. 7).

The most revealing figure of an enterprise's growth possibilities is the *reserve*. Here the instalments of debts and own financing of investment are deducted from the financing profit. This ratio describes the real financial situation, as well as management's possibility to improve or extend the competitive edge of the enterprise. It may even depict a firm's ability to stay in business. Reserves divided by financing profit eliminates the effect of size of the enterprise and enables a comparison between enterprises and enterprise classes. Reserves in euros were again greatest in the largest enterprises. The median reserve in euros for the smallest enterprises was negative. The median value of the reserve was so small in all enterprise classes, that it covers at most only a down payment deposit for purchase

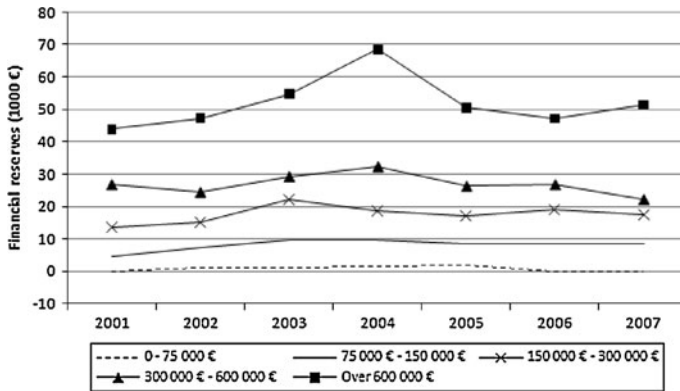


Fig. 8 Medians of the financial reserves by turnover class, 2001–2007

of a forwarder. Enterprise's abilities to grow are therefore very limited (Table 7). The weak position of the smallest turnover enterprises is revealed by the *equity financing share of investment* (Fig. 7).

For the forest harvesting contractors, the median reserve was only 17,600€ in 2007. The growth opportunities of smaller enterprises do not appear promising. The medians of reserves by enterprise size class varied only slightly during the study period. Reserves in euro value were so large for large enterprises that growth and business development was possible (Fig. 8).

The question arises whether the smallest enterprises in Finland have a future, especially during a recession. The forest industry customers prefer negotiating with fewer forest contractors who might have subcontractors (Rekilä and Räsänen 2008). The modest reserves suggest that only the larger enterprises have the capacity to grow and to accept the wider responsibilities proposed by the forest industries.

Solidity Needed

The 'wood harvesting' business in Finland has long shown low profitability (Mäkinen 1988, 1993, Väkevä and Imponen 2001). There has been slight over-capacity and the negotiation power of small entrepreneurs has been weak (Alajoutsijärvi et al. 2001). Entrepreneurs need managerial skills and appropriate business tools to enable them to cope with the growing size of their enterprises. The traditional 'capacity service business model' for capacity-driven industry services, in which exact harvesting orders and other tasks are performed one at a time, tends towards a more effective 'partnership-based business model' (Hannus 2004) in which more comprehensive services are provided, often in enterprise networks with subcontractors (Yang and Mohammed 2008). Lately, even the interest in collaborative transportation planning to support the coordination of the wood fibre flow has risen, because important potential savings have been identified (Audy et al. 2007).

This study shows that financial resources for reorganising and developing the harvesting contracting business are limited. A quarter of enterprises do not achieve a positive result. Even larger enterprises have limited reserves. Profitability decreased towards the end of the study period 2001–2007, the median net profit percentage being about 6% in 2007. The median return on assets (ROA), return on investment (ROI) and return on equity (ROE) were also decreasing to the levels 13, 16 and 17%, respectively. The median net profit of enterprises with a turnover of less than 75,000€ had declined to 0 and 4% ROA by 2006 and 2007, respectively. Recall that profitability of wood harvesting business in Sweden was also poor (Pekka 2008) and that the profitability problems prevail also in other European countries (Rummukainen et al. 2006).

Small enterprise size and a simple form of business date from the beginning of the industry when horses were replaced by forwarders. Nowadays, businesses require harvesters and forwarders that are both complex and expensive. The median annual investment has been 40,000€, representing 15% of turnover. This suggests that machinery is infrequently renewed because of low profitability. The median net debt was approximately 50% of turnover but the smallest enterprises had a median net debt of about 80%. The median debt payback period was only 2.4 years, which is reasonable considering the usual 2–5 years utilisation time of a new machine by the first owner. Many profitability and financing ratios—including asset turnover, quick ratio and interest coverage—have been relatively stable during the study period. In contrast, net profit percentages and especially financial reserves revealed clearer changing than expected.

The median financial reserve left over for enterprise development after investment and debt servicing was only 20,000€. The median reserve exceeded 50,000€ in the largest enterprises and was next to nothing in the two smallest turnover classes. The medians were 5,000–10,000€ in enterprises with one or two machines, about 30,000€ for those with three or four machines and roughly 40,000€ for those with five or more machines. Two-thirds of enterprises were still one-machine enterprises, producing altogether less than one-third of the turnover. With the price of purchase of a new harvester an entrepreneur might easily triple their turnover, which emphasises the importance of choosing the right time to change machines.

Profitability diminishes as the proportion of thinning increases in the workload (Väkevä and Imponen 2001), but the smallest enterprises do not have negotiation power to obtain work sites with best working conditions. Wood-harvesting entrepreneurs have traditionally been experts in harvesting work and they are also typically proficient at maintaining their machines. However, the ratio analysis results suggest that entrepreneurs are less successful at managing the finances of the enterprise and, especially, need to examine critically their investment decisions.

Statistical analysis of the annual financial statement data from about 1,000 enterprises has revealed that many of the common variables and the ratios based on them are not normally distributed, with some of them exhibiting both strong skewness and kurtosis. However, even with its limitations, this enterprise database provides sound opportunities to pursue a number of new research directions, such as

an analysis of optimal investment and optimal financing policy, which are critical issues for wood harvesting contracting enterprises.

Acknowledgments We gratefully acknowledge very helpful comments of main editor Steve Harrison. The English language of the paper has been checked and improved by Dr. Ashley Selby.

References

- AKE (2008). The finnish vehicle administration. Available at http://www.ake.fi/AKE_EN/. Accessed 4 Jan 2010
- Alajoutsijärvi K, Tikkanen H, Skaates MA (2001) David against goliath: coping with adversarial customers. A three-fold relational strategy for SMEs. *J Sell Major Acc Manag* 3(4):33–51
- Audy J-F, D' Amours S, Rönnqvist M (2007) Business models for collaborative planning in transportation: an application to wood products. In: Camarinha_Matos LM, Afsarmanesh H, Novais P, Analide C (eds) *Establishing the foundation of collaborative networks*. Springer, Boston, pp 667–676
- Beranek W (1975) The cost of capital, capital budgeting and the maximization of shareholder wealth. *J Financial Quant Anal* 10(1):1–20
- Brozik D (1984) Profit productivity: an operational productivity measure for financial institutions. Dissertation, University of South Carolina, Columbia, SC, Dissertation thesis, University Microfilms International
- CCA (2000) A guide to the analysis of financial statements of Finnish companies. Committee for Corporate Analysis, Gaudeamus, Helsinki
- CCA (2005) Yritystutkimuksen tilinpäätösanalyysi [Closing of the books analysis of enterprise research]. Yritystutkimusneuvottelukunta [Committee for corporate analysis]. Gaudeamus, Helsinki. (In Finnish)
- Earl P (1983) *The economic imagination. Towards a behavioural analysis of choice*. Wheatsheaf Books, Brighton
- Fatemi A, Luft C (2002) Corporate risk management: costs and benefits. *Glob Finance J* 13(1):29–38
- Finnish Statistical Yearbook of Forestry (2009) *Statistical yearbook of forestry 2009*. Finnish Forest Research Institute, Helsinki
- Hannus J (2004) *Strategisen menestyksen avaimet. Tehokkaat strategiat, kyvykkyiden ja toimintamallit* [Keys of strategic success. Effective strategies, competencies and action models]. ProTalent, Espoo, Finland (In Finnish)
- Högnäs T (2000) *Towards supplier partnership in timber harvesting and transportation*. Forestry publications of metsähallitus [State forest and park services] 37, Finland
- Johnson HT, Kaplan RS (1987) *Relevance lost. The rise and fall of management accounting*. Harvard Business School Press, Boston, Massachusetts
- Kallunki J-P, Kytönen E (2007) *Uusi tilinpäätösanalyysi* [New analysis of financial statements]. Talentum, Helsinki (In Finnish)
- Kärhä K (2000) *Metsäpalveluyritysten menestyminen ja siihen vaikuttavat tekijät*. [Success of forest service enterprises and factors affecting on it]. Master's thesis, Lappeenranta University of Technology, School of Business (In Finnish)
- Kettunen P (1993) Financial accounting and reporting in Finland. *Eur Acc Rev* 2(3):592–602
- Laitinen EK, Laitinen T (2004) *Yrityksen rahoituskriisin ennustaminen* [Predicting the financial crisis of an enterprise]. Talentum, Helsinki (In Finnish)
- Luoma GA, Spiller EA Jr (2002) Financial accounting return on investment and financial leverage. *J Acc Educat* 20(2):131–138
- Mäkinen P (1988) *Metsäkoneurakoitsija yrittäjänä*. Summary: forest machine contractor as an entrepreneur. Finnish Forest Research Institute, Helsinki, Folia Forestalia, Series 717
- Mäkinen P (1993) *Metsäkoneyrittämisen menestystekijät*. Summary: success factors for forest machine contractors. Finnish Forest Research Institute, Helsinki, Folia Forestalia, Series 818
- Ministry of Employment and the Economy (2009) *Toimialaraportit* [Industry reports]. The ministry of employment and the economy (In Finnish). Available at: <http://www.temtoimialapalvelu.fi/index.php?l?s=5>. Accessed 4 Jan 2010

- Pekka L (2008) Var tredje skogsentreprenör gjorde förlust! [Every third entrepreneur made losses]. *Tidningen Skogsteknik* [Forest technology newspaper] 1: 34–35 (In Swedish)
- Penttinen M (2007) Portfolio management and the competitiveness of forest ownership. Dissertation, University of Joensuu, Faculty of Forest Sciences. Available at: <http://www.metla.fi/dissertationes/df43.htm>. Accessed 4 Jan 2010
- Penttinen M, Rummukainen A, Leppänen J, Mikkola, J (2009) Kuinka paljon koneyrittäjiä oikein on? [How many machine entrepreneurs are there really?] *Koneyrittäjä* [Machine entrepreneur] 1: 14–15 (In Finnish)
- Pirinen P (2005) Economic, normative pressures as drivers for the adoption of international accounting standards in Finland since 1976. *Eur Acc Rev* 14(1):213–235
- Poitras G (1994) Shareholder wealth maximization, business ethics and social-responsibility. *J Bus Ethics* 13(2):125–134
- Rekilä M, Räsänen T (2008) Laajavastuinen yrittäjyys puunhankinnassa [Broad responsibility entrepreneurship in timber harvesting]. *Metsätehon Katsaus* 33 [Forest effectiveness Review 33]. (In Finnish) Available at: http://www.metsateho.fi/files/metsateho/Katsaus/Katsaus_033.pdf. Accessed 4 Jan 2010
- Rummukainen A, Brogt T, Kastenholz E (2006) Challenges for forestry contractors: various structures but mutual problems in Finland, Germany, Poland and Romania. In: Niskanen A (ed). *Issues affecting enterprise development in the forest sector in Europe*. University of Joensuu, Faculty of Forestry, Research Notes 169: 149–174. Available at: http://joypub.joensuu.fi/publications/other_publications/niskanen_issues/index_en.html. Accessed 4 Jan 2010
- Salmi T (1978) A comparative review of the Finnish expenditure-revenue accounting. Working paper 78–2. European institute for advanced studies in management. Also available at <http://lipas.uwasa.fi/~ts/comp/comp.html>. Accessed 5 Jun 2009
- Salmi I (2006) Mitä tilinpäätös kertoo? [What does a closing of the accounts tell?] 4. renewed edition. Edita, Helsinki (In Finnish)
- Salmi T, Martikainen T (1994) A review of the theoretical and empirical basis of financial ratio analysis. *Fin J. of Bus. Econ* 43(4): 426–448. Available at: <http://lipas.uwasa.fi/~ts/ejre/ejre.html>. Accessed 4 Jan 2010
- Soirinsuo J, Mäkinen P (2009) Importance of the financial situation for the growth of a forest machine entrepreneur. *Scand J For Res* 24(3):264–272
- Solmio H, Alanen V-M (2008) Lämpöyrittäjätöimintä vuonna 2007. Summary: heating entrepreneur activity in 2007. TTS Research (work efficiency institute). *For Bull Ser* 725:1–4
- Statistics Finland (2009) Finnish enterprises. Available at: http://www.stat.fi/til/syr/index_en.html. Accessed 4 Jan 2010
- Stora Enso (2007) Stora Enso Oyj Pörssitiedote 29.3.2007 [Stora Enso Ltd Stock exchange notice] (In Finnish) Available at: <http://porssi.talouselama.fi/listsml.aspx?list=pressdetail&tabname=pressdetailtab&id=HUG2007032900110604>. Accessed 4 Jan 2010
- Teräanne P (1993) Comparison between the present Finnish accounting regulation and the 4th and 7th EC directives. Commission of the European communities, directorate general, internal market and financial services. Company law and accounting standards, Brussels
- The Trade Association of Finnish Forestry and Earth Moving Contractors (2008) *Tuloskysely 2008. Metsäkone, turve, metsänparannus, maanrakennus ja metsäenergia* [Result questionnaire 2008. Forest machine, peat, forest improvement, excavation work and forest energy]. The trade association of finnish forestry and earth moving contractors. Sitratie 7, 00420 Helsinki (In Finnish)
- The Trade Association of Finnish Forestry and Earth Moving Contractors (2009) Available at: <http://www.koneyrittajat.fi/?id=103>. Accessed 4 Jan 2009
- Tornator (2003) Corporate securisation of the year by structured finance international. Structured finance international. Available at: <http://www.tornator.fi/Item?uid=58574/>. Accessed 14 Mar 2009
- Turkulainen P (2008) Puunkorjuuyritysten liikevaihto jälleen hyvässä kasvussa. [Wood harvesting enterprise turnover is again showing good growth]. *Koneyrittäjä* [Machine entrepreneur] 2: 18–20 (In Finnish)
- Uusitalo J, Markkola J-M (2006) Entrepreneurship in forestry: is it worth activating? *Forestry Studies* 45:67–73. Available at: http://mivana.emu.ee/orb.aw/class=file/action=preview/id=261970/Mets_45_08_Uusitalo_Markkola.pdf. Accessed 4 Jan 2010
- Väkevä J, Imponen V (2001) Puutavaran korjuu- ja kuljetusyritysten kannattavuus vuosina 1995–2000. (Profitability of wood harvesting and transport enterprises in 1995–2000). *Metsäteho* [Forest

- effectiveness] report 125, pp 67 (In Finnish). Available at: <http://www.metsateho.fi/metsatehon-raportti?year=2001>. Accessed 4 Jan 2010
- Yang Z, Mohammed A (2008) Business model design for capacity-driven services from high altitude platforms. 3rd IEEE/IFIP International workshop on business-driven IT management, BDIM 2008. Article number 4540086: 118–119
- Yli-Olli P, Virtanen I (1985) Modelling a financial ratio system on the economy-wide level. Acta Wasaensia 21. Available at: http://lipas.uwasa.fi/~itv/publicat/ACTA_85.pdf. Accessed 4 Jan 2010